

## On the interpretation of the energy levels of the $4f^3$ ground configuration of the free $Nd^{3+}$ ion

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### Abstract

The positions of the energy levels of the  $4f^3$  ground configuration of the free  $Nd^{3+}$  ion is interpreted theoretically within the single-configuration approximation with a Hamiltonian involving real electrostatic, spin-orbit, and spin-spin interactions, as well as the electrostatic and spin-orbit interactions correlated by configuration mixing. The most exact theoretical description of the experimental level energies is obtained by taking into account the relativistic interactions and the correlation effects of spin-orbit coupling, which are characterized by six parameters:  $M^0$ ,  $M^2$ ,  $M^4$ ,  $P^2$ ,  $P^4$ , and  $P^6$ . For all the interactions included in the Hamiltonian, consistent sets of semiempirical parameters are found. © 2007 Pleiades Publishing, Ltd.

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